Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (previously presented) A hollow fiber membrane contactor comprising:

a cartridge;

a shell having two ends and an opening, and being adapted for enclosing said cartridge;

a first end cap; and

a second end cap;

said cartridge further comprising;

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each end of said center tube ends;

a plug located at said first tube sheet;

said fiber lumens being open at the first tube sheet and said hollow fiber lumens being closed at the second tube sheet;

said first end cap and said first tube sheet defining a first head space therebetween; said first end cap having an opening therethrough, wherein said first end cap opening being in communication with hollow fiber lumens via first head space;

said second end cap having an opening, said second end cap opening being communication with said center tube;

wherein fluid being introduced into said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening, and a vacuum being applied via said first cap end opening;

wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material.

2. (canceled)

3. (previously presented) The hollow fiber membrane contactor according to Claim 1, wherein said same material being polyethylene.

4. (original) The hollow fiber membrane contactor according to Claim 1, wherein said shell having a diameter of 4 inches (10 cm) or less.

5. (original) The hollow fiber membrane contactor according to Claim 1, wherein said shell having a length of 24 inches (60 cm) or less.

6. (original) The hollow fiber membrane contactor according to Claim 1, said contactor further comprising a baffle.

7. (previously presented) A system for degassing a liquid comprising:

a liquid under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

a shell having two ends and an opening, and being adapted for enclosing said cartridge;

a first end cap; and

a second end cap;

said cartridge further comprising;

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each end of said center tube ends;

a plug located at said first tube sheet;

said fiber lumens being open at the first tube sheet and said hollow fiber lumens being closed at the second tube sheet;

said first end cap and said first tube sheet defining a first head space therebetween; said first end cap having an opening therethrough, wherein said first end cap opening being in communication with hollow fiber lumens via first head space;

said second end cap having an opening, said second end cap opening being communication with said center tube;

wherein said fluid under the elevated pressure being introduced to said contactor via said second end cap opening, said fluid under the elevated pressure being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening;

wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material.

8. (previously presented) A hollow fiber membrane contactor comprising:

a cartridge;

a shell having two ends, and an opening, adapted to enclose said cartridge; and

end caps welded to each said shell end;

said cartridge comprising;

a perforated center tube having two ends;

a hollow fiber fabric surrounding said tube, said hollow fiber fabric comprising hollow fiber membranes, said hollow fiber membranes having a lumen;

a tube sheet affixing said fabric to said tube at each said tube end; and

a plug located at one end of said tube;

wherein hollow fiber lumens being open at the tube sheet next to said plug and hollow fiber lumens being closed at the other tube sheet;

wherein said end cap and said tube sheet having open lumens defining a head space therebetween and said end cap having an opening therethrough and said opening being in communication with head space; said head space being in communication with said hollow fiber lumens at the tube sheets next to said plug;

wherein said other end cap having an opening therethrough and said opening being in communication with said center tube;

wherein fluid introduced into said contactor via said opening in communication with said center tube being distributed across said hollow fiber fabric and exiting said contactor via said opening through said shell, and a vacuum being applied via said opening in communication with said head space;

wherein said shell, said end caps, said center tube, said tube sheets, and said plug are made from a same material.

9. (canceled)

10. (previously presented) The hollow fiber membrane contactor according to Claim 8, wherein said same material being polyethylene.

11. (original) The hollow fiber membrane contactor according to Claim 8, wherein said shell having a diameter of 4 inches (10 cm) or less.

12. (original) The hollow fiber membrane contactor according to Claim 8, wherein said shell having a length of 24 inches (60 cm) or less.

13. (original) The hollow fiber membrane contactor according to Claim 8, said contactor further comprising a baffle.

14. (previously presented) A system for introducing a gas into a liquid comprising:

a liquid;

a gas under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

a shell having two ends and an opening, and being adapted for enclosing said cartridge;

a first end cap; and

a second end cap;

said cartridge further comprising;

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each end of said center tube ends;

a plug located at said first tube sheet;

said fiber lumens being open at the first tube sheet and said hollow fiber lumens being closed at the second tube sheet;

said first end cap and said first tube sheet defining a first head space therebetween; said first end cap having an opening therethrough, wherein said first end cap opening being in communication with hollow fiber lumens via first head space;

said second end cap having an opening, said second end cap opening being communication with said center tube;

wherein said gas under the elevated pressure being introduced into said hollow fiber lumens via said first end cap opening, and simultaneously said fluid being introduced to said contactor via said second end cap opening, said fluid being distributed across

said hollow fiber fabric, said fluid then exiting said contactor via said shell opening;

wherein said shell, said first end cap, said second end cap, said center tube, said first tube sheet, said second tube sheet, and said plug are made from a same material.

15. (previously presented) The hollow fiber membrane contactor according to claim 1 wherein said shell opening being located at a midpoint between said two ends of said shell.

16. (previously presented) The system for degassing a liquid according to claim 7 wherein said shell opening being located at a midpoint between said two ends of said shell.

17. (previously presented) The hollow fiber membrane contactor according to claim 8 wherein said shell opening being located at a midpoint between said two ends of said shell.

18. (previously presented) The system for degassing a liquid according to claim 14 wherein said shell opening being located at a midpoint between said two ends of said shell.

19. (new) A hollow fiber membrane contactor comprising:

a cartridge;

a shell having two ends and an opening, and being adapted for enclosing said cartridge;

a first end cap; and

a second end cap;

said cartridge further comprising;

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each end of said center tube ends;

a plug located at said first tube sheet;

said fiber lumens being open at the first tube sheet and said hollow fiber lumens being closed at the second tube sheet;

said first end cap and said first tube sheet defining a first head space therebetween; said first end cap having an opening therethrough, wherein said first end cap opening being in communication with hollow fiber lumens via first head space;

said second end cap having an opening, said second end cap opening being communication with said center tube;

wherein fluid being introduced into said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor

via said shell opening, and a vacuum being applied via said first cap end opening.

20. (new) A system for degassing a liquid comprising:

a liquid under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

a shell having two ends and an opening, and being adapted for enclosing said cartridge;

a first end cap; and

a second end cap;

said cartridge further comprising;

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each end of said center tube ends;

a plug located at said first tube sheet;

said fiber lumens being open at the first tube sheet and said hollow fiber lumens being closed at the second tube sheet;

said first end cap and said first tube sheet defining a first head space therebetween; said first end cap having

an opening therethrough, wherein said first end cap opening being in communication with hollow fiber lumens via first head space;

said second end cap having an opening, said second end cap opening being communication with said center tube;

wherein said fluid under the elevated pressure being introduced to said contactor via said second end cap opening, said fluid under the elevated pressure being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening.

21. (new) A hollow fiber membrane contactor comprising:

a cartridge;

a shell having two ends, and an opening, adapted to enclose said cartridge; and

end caps welded to each said shell end;

said cartridge comprising;

a perforated center tube having two ends;

a hollow fiber fabric surrounding said tube, said hollow fiber fabric comprising hollow fiber membranes, said hollow fiber membranes having a lumen;

a tube sheet affixing said fabric to said tube at each said tube end; and

a plug located at one end of said tube;

wherein hollow fiber lumens being open at the tube sheet next to said plug and hollow fiber lumens being closed at the other tube sheet;

wherein said end cap and said tube sheet having open lumens defining a head space therebetween and said end cap having an opening therethrough and said opening being in communication with head space; said head space being in communication with said hollow fiber lumens at the tube sheets next to said plug;

wherein said other end cap having an opening therethrough and said opening being in communication with said center tube;

wherein fluid introduced into said contactor via said opening in communication with said center tube being distributed across said hollow fiber fabric and exiting said contactor via said opening through said shell, and a vacuum being applied via said opening in communication with said head space.

22. (new) A system for introducing a gas into a liquid comprising:

a liquid;

a gas under an elevated pressure;

a hollow fiber membrane contactor comprising;

a cartridge;

a shell having two ends and an opening, and being adapted for enclosing said cartridge;

a first end cap; and

a second end cap;

said cartridge further comprising;

a perforated center tube having a first end and a second end;

a hollow fiber fabric comprising hollow fiber membranes, each said hollow fiber membrane having a lumen, said hollow fiber fabric surrounding said center tube;

a first tube sheet and a second tube sheet affixing said fabric to said center tube at each end of said center tube ends;

a plug located at said first tube sheet;

said fiber lumens being open at the first tube sheet and said hollow fiber lumens being closed at the second tube sheet;

said first end cap and said first tube sheet defining a first head space therebetween; said first end cap having an opening therethrough, wherein said first end cap opening being in communication with hollow fiber lumens via first head space;

said second end cap having an opening, said second end cap opening being communication with said center tube;

wherein said gas under the elevated pressure being introduced into said hollow fiber lumens via said first end cap opening, and simultaneously said fluid being introduced to said contactor via said second end cap opening, said fluid being distributed across said hollow fiber fabric, said fluid then exiting said contactor via said shell opening.